DOCUMENT RESUME

ED 158 151 CG 012 604

AUTHOR Horan, John J.; And Others
TITLE Coping With Pain: Studies in Stress Inoculation.
PUB DATE 78
NOTE 33p.; Paper presented at the Annual Meeting of the American Educational Research Association (Toronto, Ontario, CANADA, March, 1978)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Adjustment (to Environment); Laboratory Experiments; *Physical Health; *Physiology; Psychological Patterns; *Skill Development; *Stimulus Behavior; Stress Variables; *Training Techniques
IDENTIFIERS *Pain

ABSTRACT

The stress-inoculation paradigm for helping clients deal with pain consists of education about the psychological dimensions of pain, training in a number of coping skills relevant to each dimension, and practice in applying these skills to the noxious stimulus. Presented are two studies, the first of which represents a component analysis of stress inoculation, and the second, an enhancement of the generalization potential of the paradigm and an exploration of the effect of procedural variations in the exposure component. Additional studies, currently in progress, are also described. (Author/CKJ)

Coping With Pain: Studies In Stress Inoculation

John J. Horan

Gail Hackett

Jay D. Buchanan

Dick Judah

Paul Zumoff

Linda Leaman

Barbara Seibel

Kathleen Williams

Cheryl Hetherington

Lynn Mebane

Christopher I. Stone

Deborah Demchik Stone

Division of Counseling and Educational Psychology

The Pennsylvania State University

University Park, Pa.

Paper presented at the annual meeting of the American Educational Research Association, Toronto, 1978.

Overview

The stress-inoculation paradigm for helping clients deal with pain consists of education about the psychological dimensions of pain á la Melzack, training in a number of coping skills relevant to each dimension, and practice in applying these skills to the noxious stimulus. Our first study was a component analysis of stress inoculation. In our second study, we attempted to enhance the generalization potential of the paradigm and to explore the effect of procedural variations in the exposure component. Other studies in progress are also described.

Study I

Coping With Pain: A Component Analysis of Stress-Inoculation

The stress-inoculation paradigm for helping clients deal with pain consists of education about the psychological dimensions of pain á la Melzack, training in a number of coping skills relevant to each dimension, and practice in applying these skills to the noxious stimulus. In order to determine which of these treatment components have a reactive effect, 70 screened clients were randomly assigned to one of five treatment conditions. The cold pressor and pressure algometer tasks respectively yielded three direct and three generalization measures. On all direct measures coping skills training resulted in highly significant improvement. Neither education (i.e., insight) nor exposure has any effect. In comparison to a nonspecific treatment the stress inoculation package proved useful on two direct measures; however, on the generalization measures neither stress-inoculation nor any of the components had any impact. Heart rate changes, observed for exploratory purposes, were consistent with current research and speculation.

Coping With Pain: A Component Analysis of Stress-Inoculation

Pharmacological and surgical procedures for the physiological control of pain have been fraught with difficulties including debilitating side effects and a disheartening tendency for pain to return to pretreatment levels (Melzack, 1973). Recent conceptualizations of pain acknowledge the role of psychological variables and have thus spawned a number of cognitive-behavioral coping strategies. For example, several authors have investigated the facilitative effects of relaxation training and deep breathing exercises (Bobey & Davidson, 1970; McKechnie, 1975; Mulcahy & Janz, 1973). Evidence in favor of "somatization" or the focusing on a painful bodily sensation in a detached manner has also been reported (Bobey & Davidson, 1970; Evans & Paul, 1970). "In vivo" emotive imagery is another effective pain-coping technique involving the generation of anxiety-blocking images during discomforting situations (Horan, 1973, 1976; Horan & Dellinger, 1974; Horan, Layng, & Pursell, 1976; Westcott & Horan, 1975; Stone, Horan, & Demchik-Stone, 1977). Other imagery manipulations which have proved to be useful in coping with pain include transforming the context of the pain or the pain itself (Barber & Hahn, 1962; Blitz & Dinnerstein, 1968, 1971; Neufeld, 1970; Wolff & Horland, 1967).

Meichenbaum and Turk (1976) have argued that a comprehensive coping skills program labeled "stress-inoculation" should prove to be far more clinically useful in the management of pain than any of the aforementioned single treatment strategies. Their rationale is partly based on the work of Melzack (1973) who posits three major psychological dimensions of pain, namely the sensory-discriminative, the motivational-affective, and the cogni-

tive-evaluative. Meichenbaum and Turk (1976) believe that each of these dimensions calls for a different kind of coping skill. For example, since the sensory-discriminative component suggests that muscle tension magnifies the experience of pain, relaxation training might be appropriate. The motivational-affective dimension, on the other hand, indicates that negative feelings such as anxiety or helplessness and positive feelings such as excitement or happiness can respectively increase or decrease one's perception of pain. Hence, procedures based on affect-arousing imagery situations might prove to be beneficial. Finally, because the cognitive-evaluative dimension acknowledges that expectancies about painful stimuli are related to the amount of pain reported, Meichenbaum and Turk (1976) believe that their own work in self-instruction is highly relevant. In addition to maintaining that each psychological dimension of pain calls for its own category of coping skills, Meichenbaum and Turk (1976) maintain that because of individual differences, clients should be exposed to a wide variety of coping skills, "cafeteria style," so they might pick the techniques which they perceive to be most beneficial.

Stress-inoculation training is composed of several sequential treatment components. The first component is educational in nature. Clients are provided with a conceptual framework of the psychological dimensions of pain à la Melzack (1973). The second component involves actual training in the coping skills relevant to each dimension. In the third component, clients are given the opportunity to practice these coping skills during exposure to noxious stimuli. In the only test of stress-inoculation for pain tolerance conducted to date, this latter component was presented "in vitro;"

clients were asked to imagine themselves coping with a painful stimulus (Meichenbaum & Turk, 1976). We might presume that the effectiveness of stress-inoculation would be enhanced by giving clients practice in coping with an "in vivo" noxious stimulus.

No research has been conducted on the "active ingredients" of stress-inoculation training. We do not know which of the components add to or detract from the efficacy of the treatment package. For example, on an a priori basis it might be argued that mere exposure to noxious stimuli would account for most of the "coping gain" through a simple habituation mechanism. Therefore, the purpose of our study was to conduct a component analysis of the stress-inoculation paradigm.

Five treatment cells are relevant to such an analysis: 1) no treatment, 2) nonspecific treatment, 3) coping skills alone, 4) exposure alone, and 5) stress-inoculation (combined treatment.) Use of residual gain scores would allow arrangement of these cells into a 2 x 2 + 1 design (coping skills by exposure plus no treatment). Comparisons between the no treatment and nonspecific treatment cells would determine the possible impact of the education component and concomitant placebo factors, while ANOVA main effects emerging for coping skills and/or exposure would be evidence for the worth of these latter components. Final comparisons between the nonspecific treatment and the combined treatment cells should reflect the practical utility of the stress-inoculation paradigm.

Method

Subjects

More than 125 potential clients were recruited from advanced undergraduate and beginning graduate courses in the human services area. Participation in this study served as one alternative means of meeting certain course requirements. During a pretest-screening session about one-third of the potential clients endured the cold pressor task for the ceiling of 300 seconds and were thus excluded from further participation. The remaining 70 clients were stratified on sex and pretest performance, then randomly assigned to one of two counselors and one of five treatment conditions. There were 5 males and 5 females in the no treatment control condition; all other cells had 6 of each sex. Two clients had to be replaced. One in the no treatment control condition inadvertantly learned about the active treatments; another client declined training in stress-inoculation.

Measures

The cold pressor task (Hines & Brown, 1932), which involves asking clients to immerse their dominant hand in a slurry of ice water (1° C, 33° F) for as long as they are able, served as a direct test of the treatment conditions. Three individual measures were obtained from this task: 1) total immersion time in seconds, 2) time to pain threshold in seconds and, 3) discomfort self-reported on a 7 point scale anchored with the words "none" and "extreme."

The treatment conditions were geared toward preparing the clients for coping with the cold pressor. A pressure algometer task (Merskey & Spear, 1964) served as a generalization test of the treatment conditions. This

task involves placement of the flat side of a wooden dowel 3/8 in. (.95cm) in diameter, on the midpoint of the shin bone on the client's dominant leg. The dowel protrudes through a padded concave holder, which in turn is wrapped in a blood pressure cuff and inflated at a standard rate of 5 mm hg per second. Three additional measures were obtained from this task: 1) total pressure endurance in mm hg, 2) pain threshold in mm hg, and 3) self-reported discomfort (same scale as above).

Heart rates were also monitored during the cold pressor and pressure algometer tasks through an ear lobe pick-up on a San El pulsemeter (2016). Raters recorded peak rates of responding during each task. These data were gathered for exploratory purposes.

All measures were obtained by pairs of male and female raters who were blind to the hypotheses of the study as well as to the clients' treatment conditions. Data collection demanded use of two raters; one of each sex was employed to control for possible rater-sex effects (see Meichenbaum & Turk, 1976).

Procedures

All treatments were administered within 5 days of the pretest; posttesting always occurred on the day following treatment. The treatments were carried out by a male and a female doctoral candidate in counseling psychology. Each counselor saw an equal number of male and female clients (n=3) under each treatment condition. Within these control constraints, the clients were randomly assigned to counselors as well as treatment conditions. All treatments were administered in single sessions lasting between 75 and 120

minutes in length. Specific treatment procedures were as follows:

No Treatment Control. Within one week after pretesting the clients were administered a posttest which preceded informal coping skills training.

Nonspecific Treatment. The clients were provided with the Melzack (1973) based educational component concerning the psychological dimensions of pain. This portion of the treatment lasted about 15 minutes and was followed by a summary statement from the counselors that if the clients could learn to control their anxiety they could better cope with painful stimuli. The clients then listened to a "self-help" audio tape by Albert Ellis (1976) which purports to teach methods of anxiety reduction.

Coping Skills Training. Following the educational component, the clients received training in a number of coping skills relevant to each of Melzack's (1973) dimensions. For the sensory-discriminative dimension, the clients received deep muscle relaxation training via a 25 minute audiotape (Lazarus, 1970). To deal with the motivational-affective dimension the subjects were taught distraction, somatization, in vivo emotive imagery, imaginative transformation of pain and imaginative transformation of context. They were given approximately three minutes to practice engaging in each of these strategies. The cognitive-evaluative dimension was addressed with self-instructions training. (These coping skills are referenced in the introductory paragraphs and are more fully explicated in the Meichenbaum and Turk (1976) manuscript.) During a final 3 minute practice trial the clients were asked to self-instruct, relax, and engage in the motivational-affective technique(s) which they felt most beneficial.

Exposure. The logic of this treatment condition required alteration of the education component to focus on an habituation rationale. The clients were told that practice with the cold pressor task would improve their performance. Treatment essentially consisted of 6 repetitions of the cold pressor punctuated by rest (i.e., warming) periods of at least 5 minutes duration. Practice ceilings were set at 3 minutes.

Stress-Inoculation. This treatment combined the coping skills and exposure components. The clients were educated about the psychological dimensions of pain, trained in the coping skills relevant to each dimension, and then given practice in implementing each of the motivational-affective coping skills during five presentations of the cold pressor task. During a sixth exposure to the cold pressor the clients were asked to self-instruct, relax, and engage in the motivational-affective technique(s) which they judged to be most effective. Practice ceilings were likewise set at 3 minutes.

Results

Preliminary Analyses

One factor analyses of variance conducted on the pretest raw scores indicated that none of the five treatment conditions differed on any measure prior to treatment. Hence, our random assignment procedures were successful in equalizing the treatment groups. Table 1 presents the means and standard deviations of residual gain scores produced by each treatment condition on each dependent measure. [A gain is residualized by expressing the posttest score as a deviation from the posttest-on-pretest regression line (cf. Chronbach & Furby, 1970; Dubois, 1957)].

Insert Table 1 about here

Component Effects: Direct

The three measures obtained from the cold pressor task were used to evaluate the direct efficacy of the stress-inoculation treatment components. Comparisons between the no treatment and nonspecific treatment conditions were all insignificant [tolerance t (18) = -.10; threshold t (18) = -1.07; discomfort t (18) = .96]. Since the education component of the stress-inoculation paradigm was embedded in the nonspecific treatment, findings of no differences here suggest that the education component alone and concomitant placebo factors do not account for improved pain-coping performance.

To evaluate the direct impact of the coping skills and exposure components, 2 x 2 (presence or absence of coping skills by presence or absence of exposure) analyses of variance were conducted on each dependent variable. Significant main effects for coping skills were found on all measures [tolerance F (1,44) = 7.60, $p < .008$; threshold F (1,44) = 11.51, $p < .001$; discomfort F (1,44) = 6.45, $p < .015$] No significant main effects emerged for exposure [tolerance F (1,44) = 3.09; threshold F (1,44) = 1.35; discomfort F (1,44) = .25]. Nor did any significant interactions occur [tolerance F (1,44) = 1.72; threshold F (1,44) = 2.38; discomfort F (1,44) = .45] . Essentially then on direct measures coping skills proved to be the only reactive component in the stress-inoculation paradigm.

In order to determine the utility of stress inoculation, Tukey WSD post hoc comparisons (Games, 1971) were conducted between the nonspecific treatment

and combined treatment (i.e. stress inoculation) cells. Significant differences occurred on tolerance and on threshold (both p's <.05), but not on self-reported discomfort. Thus, controlling for placebo factors, stress-inoculation training appears to have substantial therapeutic utility.

Component Effects: Generalization

The three measures obtained from the pressure algometer task were used to evaluate the generalization potential of the stress-inoculation treatment components. As with the direct measures, comparisons between the no treatment and nonspecific treatment conditions were all insignificant [tolerance t (18) = .27; threshold t (18) = 1.22; discomfort t(18) =-.18)], indicating no reactivity for the education component and concomitant placebo factors.

To determine the generalization impact of the coping skills and exposure components, similar 2 x 2 analyses of variance were conducted on each dependent variable. No significant main effects occurred for coping skills [tolerance F (1,44) = .60; threshold F (1,44) = 1.73; discomfort F (1,44) = 1.72] or for exposure [tolerance F (1,44) = 3.64; threshold F (1,44) = 2.97; discomfort F (1,44) = .118]. Nor did any interactions occur [tolerance F (1,44) = .15; threshold F (1,44) = .04; discomfort F (1,44) = .95]. Although all that can be said with confidence is that neither the coping skills nor exposure components had any significant impact on the generalization variables, it is interesting to note that the main effect p levels for exposure were .063 on tolerance and .092 on threshold.

Finally, Tukey WSD post hoc comparisons between the nonspecific treatment and combined treatment cells were also not significant on any of the gener-

alization variables [tolerance, threshold and discomfort; p's $> .05$]. The pronounced efficacy of the stress-inoculation paradigm on the direct measures was not repeated on the generalization measures.

Heart Rate Changes

Peak heart rate levels were recorded during both the cold pressor and pressure algometer tasks. No differences occurred between the no treatment control and nonspecific treatment conditions [cold pressor t (18) = -1.17; pressure algometer t (18) = -1.51]. In both 2 x 2 (coping skills by exposure) analyses of variance, however, significant coping skills main effects and interaction effects emerged [cold pressor main F (1,44) = 8.77, $p < .005$; interaction F (1,44) = 10.25, $p < .003$. Pressure algometer main F (1,44) = 6.72, $p < .013$; interaction F (1,44) = 4.49, $p < .04$]. Tukey WSD post hoc analysis indicated that the clients who engaged in coping skills alone had significantly higher heart rates during the cold pressor and pressure algometer tasks than those clients in the nonspecific treatment (both p's .05). No other comparisons were significant.

Discussion

The nonspecific treatment condition contained both the education component of stress-inoculation and an Ellis-based procedure for reducing anxiety which magnifies the experience of pain. In comparison to the no treatment control condition this nonspecific treatment effected no changes whatsoever on any measure of pain-coping performance. Since it is unlikely that the Ellis-based procedure diminished the efficacy of the nonspecific treatment, it can be argued with reasonable certainty that the education

alone or "insight" proffered by stress-inoculation does not produce any therapeutic effects. This finding does not suggest that the education-component ought to be dropped from the stress-inoculation paradigm as excess baggage. In point of fact, the other components of stress-inoculation are built on the education framework and cannot be logically examined or clinically administered in isolation. Thus, the education component seems to be necessary but insufficient for improvement in pain-coping performance.

The efficacy of the coping skills component, on the other hand, was quite pronounced on all three direct measures. The p levels for cold pressor tolerance, threshold, and discomfort were less than .008, .001, and .015 respectively. Not surprisingly, however, this marked success did not generalize to the measures derived from the pressure algometer task. Generalization is more likely to occur from planning and preparation rather than from prayer (cf. Bandura, 1969). We focused our treatment conditions on the cold pressor task alone. Clinicians using the stress-inoculation paradigm ought to prepare their clients for coping with all likely forms of pain.

In spite of our expectation that the exposure component would have a dramatic impact on direct pain coping ability, such did not occur. Instead of habituation or anxiety-extinction, our six presentations of the cold pressor task during treatment may have sensitized many clients to this particular noxious stimulus, thereby undermining any possible therapeutic effects. We base this suspicion on spontaneous remarks by our raters that a number of clients made comments of the order "Oh no, not that damn ice water again!" Future research which would systematically vary the number of exposures during treatment (say 1 vs 6 vs 20) might prove quite informative. Interest-

ingly enough, those clients who received multiple cold pressor exposures came very close to displaying improved coping ability on two of the three generalization measures (tolerance $p < .063$, threshold $p < .092$). We may have serendipitously found another pain-coping strategy. That is, repeated exposures to a particular noxious stimulus may result in enhanced ability to cope with other noxious stimuli!

The practical utility of stress inoculation as a therapeutic strategy was evidenced by significant differences occurring between the combined-treatment and nonspecific treatment cells on two of the three direct measures (tolerance and threshold, both p's $< .05$). Thus stress-inoculation results in improved pain-coping ability over and above that which might be attributed to education about pain and placebo factors.

The exploratory findings of increased heart rates for the coping skills cell in comparison to the nonspecific treatment cell are consistent with recent research and speculation (Hanley & Eure, 1976; Horan, et. al. 1976). Essentially, much of the imagery produced by the various coping skills could reasonably be expected to produce heart rate acceleration. The differences between these two cells, then, probably suggests only that the coping skills clients were doing what they were trained to do.

Finally, the importance of empirically derived control procedures in evaluating treatment effects (e.g., desensitization vs. bibliotherapy) can not be ignored (cf., Kazdin & Wilcoxson, 1976). However, in this study we made an a priori decision not to manipulate rationale credibility. To do so would defeat that purpose of a component analysis which must treat the actual rationale of each component as part of that component. It would be interesting to observe if the various cells generate differential treatment credibility; we suspect not. But, for example, to soften the credibility of one component

to bring it in line with the others would preclude any generalization of this study to a clinical setting. Our compromise was to build a very solid nonspecific treatment consisting of the education component fortified by a self-help monologue from a well-known authority--Albert Ellis. Further comparisons of the entire stress-inoculation package with empirically derived control procedures are now in order.

Table 1

Means and Standard Deviations of Residual Gain Scores Produced by each Treatment Condition on each Dependent Measure

Treatment Condition	Direct Measures								Generalization Measures							
	Tolerance		Threshold		Discomfort		Heartrate		Tolerance		Threshold		Discomfort		Heartrate	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
No Treatment	-47.6	88.7	2.12	87.1	.19	.89	-3.97	9.13	-21.01	21.0	-12.21	17.9	.056	.88	.43	13.5
Nonspecific Treatment	-76.42	51.07	-27.81	19.35	.52	.7	-8.51	8.99	-16.21	56.52	- .7	42.35	-.02	.97	-7.08	8.89
Exposure Alone	8.83	124.39	-34.71	16.39	.45	1.27	1.75	9.74	11.08	44.1	19.89	34.36	.36	.94	-.78	12.62
Coping Skills Alone	36.58	110.19	5.80	83.34	-.8	1.69	9.01	8.11	- 9.25	89.48	-12.7	35.39	-.11	.99	6.87	8.27
Combined Treatment (i.e., stress-inoculation)	48.92	82.48	54.95	90.87	-.32	1.76	1.07	12.09	31.88	47.79	3.68	36.07	-.29	1.06	.63	10.66

References

Bandura, A. Principles of behavior modification. New York: Holt Rinehart and Winston, 1969.

Barber, T. X. and Hahn, K. W. Physiological and subjective responses to pain-producing stimulation under hypnotically-suggested and waking-imagined "analgesia." Journal of Abnormal and Social Psychology, 1962, 65, 411-418.

Blitz, B. and Dinnerstein, A. J. Role of attentional focus in pain perception: Manipulation of response to noxious stimulation by instructions. Journal of Abnormal Psychology, 1971, 77, 42-45.

Bobey, M. J. and Davidson, P. O. Psychological factors affecting pain tolerance. Journal of Psychosomatic Research, 1970, 14, 371-376.

Cronbach, L. J. and Furby, L. How we should measure "change" - or should we? Psychological Bulletin, 1970, 74, 68-80.

DuBois, P. H. Multivariate correlational analysis. New York: Harper & Brothers, 1957.

Ellis, A. Rational emotive self-help techniques. In C. M. Franke (Ed.) Behavior therapy: Techniques, principles and patient aids, vol. 2. New York: Biomonitoring Applications, Inc., 1976 (audiotape cassette).

Evans, M. and Paul, G. Effects of hypnotically suggested analgesia on physiological and subjective responses to cold stress. Journal of Consulting and Clinical Psychology, 1970, 35, 362-371.

Games, P. A. Multiple comparisons of means. American Educational Research Journal, 1971, 8, 531-565.

Hanley, J. N. & Euse, F. J. Skin conductance and heart rate responses to neutral, positive, and negative imagery: Implications for covert behavior

therapy procedures. Behavior Therapy, 1976, 7, 494-503.

Hines, E. A. and Brown, G. E. A standard stimulus for measuring vasomotor reactions: Its application to the study of hypertension. Proc. Staff Meeting Mayo Clinic, 1932, 7, 332.

Horan, J. J. "In vivo" emotive imagery: A technique for reducing childbirth anxiety and discomfort. Psychological Reports, 1973, 32, 1328.

Horan, J. J. Coping with inescapable discomfort through "in vivo" emotive imagery. In Krumboltz, J. D. and Thoresen, C. E. (Eds.) Counseling Methods. New York: Holt, Rinehart, and Winston, 1976.

Horan, J. J. and Dellinger, J. K. "In vivo" emotive imagery: A preliminary test. Perceptual and Motor Skills, 1974, 39, 359-362.

Horan, J. J., Layng, F. C. and Pursell, C. H. A preliminary study of the effects of "in vivo" emotive imagery on dental discomfort. Perceptual and Motor Skills, 1976, 42, 105-106.

Lazarus, A. A. Relaxation exercise I. In Daily living: Coping with tensions and anxieties. Chicago: Instructional Dynamics, 1970 (audiotape cassette).

McKechnie, R. J. Relief from phantom limb pain by relaxation exercises. Journal of Behavior Therapy and Experimental Psychiatry, 1975, 6, 262-263.

Meichenbaum, D. and Turk, D. The cognitive - behavioral management of anxiety, anger, and pain. In Davidson, P.O. (Ed.) The behavioral management of anxiety, depression and pain. New York: Brunner/Mazel, 1976.

Melzack, R. The puzzle of pain. New York: Basic Books, Inc., 1973.

Merskey, H., and Spear, F. G. The reliability of the pressure algometer. British Journal of Social and Clinical Psychology, 1964, 3, 130-136.

Mulcahy, R. A. and Janz, N. Effectiveness of raising pain perception threshold in males and females using a psychoprophylactic childbirth technique during

induced pain. Nursing Research, 1973, 22, 423-427.

Neufeld, R. The effect of experimentally altered cognitive appraisal on pain tolerance. Psychonomic Science, 1970, 20, 106-107.

Stone, C. I., Horan, J. J. and Demchik-Stone, D. A. Coping with pain: A component analysis of Lamaze and cognitive-behavioral procedures. Paper presented at the annual meeting of the American Educational Research Association, New York, April, 1977.

Westcott, T. B. and Horan, J. J. The effects of anger and relaxation forms of in vivo emotive imagery on pain tolerance. Canadian Journal of Behavioral Science, 1977, in press.

Wolff, B. B. and Horland, A. A. Effect of suggestion upon experimental pain: A validation study. Journal of Abnormal Psychology, 1967, 72, 402-407.

* Kazdin, A. E. and Wilcoxin, L. A. Systematic desensitization and nonspecific treatment effects: A methodological evaluation. Psychological Bulletin, 1976, 83, 729-758.

Study II

Improving the Exposure Component and Generalization Potential Of Stress Inoculation for Pain

In a previous component analysis of stress inoculation training (SIT) for pain, the exposure component (which involves six practice sessions) proved ineffective; moreover the efficacy of the other ingredients was not repeated on the generalization measures. The present study compared three variations in the exposure component and found that SIT with a single practice session on the cold pressor task proved more helpful than SIT with no practice at all, which in turn was no worse than SIT with six practice sessions. Moreover, therapeutic attention to generalization resulted in increased pain tolerance on the pressure algometer task.

Improving the Exposure Component and Generalization Potential of Stress Inoculation for Pain

The stress-inoculation paradigm for helping clients deal with pain consists of 1) education about the psychological dimensions of pain á la Melzack (1973), 2) training in a number of coping skills relevant to each dimension, and 3) practice in applying these skills during exposure to the noxious stimulus. [See Meichenbaum and Turk (1976) and Horan, Hackett, Buchanan, Stone, and Demchik-Stone (1977) for a more detailed description.] In a component analysis of stress inoculation Horan et al (1977) found that the coping skills component had a significant impact on cold pressor threshold, tolerance, and reported discomfort. Neither the education nor exposure components, however, had any effect. Moreover, the pronounced efficacy of the coping skills component and the entire stress-inoculation package on the cold pressor measures was not repeated on generalization measures derived from a pressure algometer.

The first objective of the present study was to determine if procedural variations in the exposure component would improve its utility. In the Horan et al project, subjects practiced different coping skills during six exposures to the cold pressor. Quite possibly these multiple exposures produced a sensitizing effect. Perhaps fewer exposures would enhance the efficacy of this component. The second objective of this study was to explore the possibility that preparing the subjects for other forms of pain would improve the generalization potential of the entire stress-inoculation paradigm. In the Horan et al project, subjects were simply given the pressure algometer task following treatment. No "therapeutic bridges" were constructed.

Essentially, this study contrasted three versions of stress-inoculation training (SIT) for pain: 1) SIT without the exposure component, 2) SIT with a single exposure, and 3) SIT with six exposures. All versions specifically attempted to prepare the subjects for cold pressor pain, but applications to other forms of pain were also incorporated into the training.

Method

Subjects

Thirty-seven female clients were recruited from undergraduate courses in the human services area. Participation in this study served as one alternative means of meeting course requirements. Nine of these women endured the cold pressor task for the five-minute ceiling and were excluded from the study. The remaining twenty-eight were stratified on pretest performance and then randomly assigned to one of three treatments and one of two experimenters (a male and a female doctoral candidate in counseling psychology).

Measures

The cold pressor task (Hines & Brown, 1932), which involves asking clients to immerse their dominant hand in a slurry of ice water (1° C, 33° F) for as long as they are able, served as a direct test of the treatment conditions. Three individual measures were obtained from this task: 1) total immersion time in seconds, 2) time to pain threshold in seconds and, 3) discomfort self-reported on a 7 point scale anchored with the words "none" and "extreme."

The pressure algometer task (Merskey & Spear, 1964) served as a generalization test of the treatment conditions. This task involves placement of the flat side of a wooden dowel 3/8 in. (.95cm) in diameter, on the midpoint of the shin bone on the client's dominant leg. The dowel protrudes through a padded concave holder, which in turn is wrapped in a blood pressure cuff and inflated at a standard rate of 5 mm hg per second. Three additional measures were obtained from this task: 1) total pressure endurance in mm hg, 2) pain threshold in mm hg, and 3) self-reported discomfort (same scale as above).

All data was collected by a female rater who was blind to the nature of the experiment and the treatments received by the clients.

Procedures

All treatments were administered within 5 days of the pretest; post-testing always occurred on the day following treatment. All treatments were administered in single sessions lasting between 90 and 120 minutes in length. Specific treatment procedures were as follows:

SIT-No-exposures. The clients were provided with the Melzack (1973)-based educational component concerning the psychological dimensions of pain. This portion of treatment lasted about 15 minutes and was followed by training in a number of coping skills relevant to each of Melzack's dimensions. For the sensory-discriminative dimension, the clients received deep muscle relaxation training via a 25 minute audiotape (Lazarus, 1970). To deal with the motivational-affective dimension the subjects were taught distraction, somatization, in vivo emotive imagery, imaginative transformation of pain and imaginative transformation of context. They were given approximately

three minutes to practice engaging in each of these strategies. The congitive-evaluative dimension was addressed with self-instructions training. [These coping skills are referenced in Horan et al (1977) and are fully explicated in Meichenbaum and Turk (1976).] During a final 3 minute practice trial the clients were asked to self-instruct, relax, and engage in the motivational-affective technique(s) which they felt most beneficial.

SIT-One-exposure. This treatment was identical to the last with the exception that during the final 3 minute practice trial the clients were given a single exposure to the cold pressor task.

SIT-Six-exposures. This treatment was identical to the last with the exception that during each of the 3 minute practice trials which followed training in the various motivational affective strategies, the clients were exposed to the cold pressor task.

In addition to specific training for cold pressor pain, all of the SIT treatments included an instructional unit designed to enhance generalization. Clients identified personally relevant discomforting situations, then the experimenters modeled the use of appropriate coping skills.

Expectancy-Demand Control Checks. The possibility that experimental conditions produce differential demands and/or expectations for improvement has been receiving increased attention in the methodology literature (c.f. Kazdin & Wilcoxon, 1976). Such influences could in fact account for gains which are ordinarily attributed to the experimental treatment. In order to determine if these rival hypotheses were operative here, all clients were given two seven-point rating scales. The first was administered

directly after presentation of the rationale early in the treatment and measured the clients' confidence in the treatment from "not confident at all" to "extremely confident". The second was administered after treatment but prior to the posttest and guaged the clients' expectations for treatment effectiveness from "not helpful at all" to "extremely helpful".

Results

Preliminary Analyses

One factor analyses of variance conducted on the pretest raw scores indicated that none of the three treatment conditions differed on any measure prior to treatment. Hence, our random assignment procedures were successful in equalizing the clients in each treatment condition. Table 1 presents the means and standard deviations of residual gain scores produced by each treatment condition on each dependent measure. [A gain is residualized by expressing the posttest score as a deviation from the posttest-on-pretest regression line (c.f. Chronbach & Furby, 1970; Dubois, 1957).]

Insert Table 1 about here

Treatment Effects

Planned comparisons were conducted on the residual gain scores produced by the SIT-No-exposure and SIT-One-exposure conditions for each dependent measure. Parenthetically we were also interested in any difference that might have occurred between the SIT-No-exposure and SIT-Six-exposures conditions. But since none were found in the Horan et al study, none were

expected here.

Differences in favor of the exposure component did appear between the SIT-No-exposure and SIT-One-exposure conditions on cold pressor tolerance [$t(26) = 1.61$, $p < .075$] and pressure algometer tolerance [$t(26) = 2.02$, $p < .025$.] No differences emerged on cold pressor threshold and discomfort or on pressure algometer threshold and discomfort. Of all the direct and generalization measures, however, tolerance provides the most crucial test.

As might have been expected from the Horan et al study, no differences occurred between the SIT-No-exposure and SIT-Six-exposures conditions on any dependant measure.

Expectancy-Demand Effects

One factor analyses of varience were conducted on the confidence and effectiveness ratings produced by each of the three treatment conditions. No differences occurred on either measure, thus supporting the supposition that the foregoing treatment effects were not produced by differential expectancies or demands.

Discussion

The results verify our suspicion that multiple exposures to painful stimuli might delute the efficacy of the stress inoculation paradigm. A curvilinear relationship between number of exposures and treatment effectiveness was found. Stress inoculation with a single exposure produced more pain tolerance than did stress inoculation with no exposures, which in turn did not differ from stress inoculation with six exposures. Unlike the Horan et al (1977) study which raised doubts about the exposure component, the

present investigation suggests that a brief exposure component can be quite beneficial.

Furthermore in the Horan et al study it was found that stress inoculation did not generalize to the pressure algometer task. In the present investigation the addition of an instructional unit designed to enhance generalization resulted in improved pressure algometer scores. Although the efficacy of this instructional unit was not experimentally demonstrated, the findings do suggest that generalization can be programmed into stress inoculation training.

Table 1

Means and Standard Deviations of Residual Gain Scores Produced by each Treatment Condition on each Dependent Measure

Treatment Condition	Direct Measures						Generalization Measures					
	Tolerance		Threshold		Discomfort		Tolerance		Threshold		Discomfort	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
SIT-No-Exposure (n=10)	-34.9	98.35	4.54	47.77	-.12	1.15	-18.31	31.48	- .32	26.29	-.23	.81
SIT-One-Exposure (n=9)	35.67	92.56	-20.67	16.2	-.41	2.1	25.45	57.71	-11.63	53.6	-.22	1.79
SIT-Six Exposures (n=9)	2.89	106.95	15.33	95.89	.55	2.11	- 5.12	42.48	12.01	49.78	.49	1.02

References

Cronbach, L. J. and Furby, L. How we should measure "change" - or should we? Psychological Bulletin, 1970, 74, 68-80.

DuBois, P. H. Multivariate correlational analysis. New York: Harper & Brothers, 1957.

Hines, E. A. and Brown, G. E. A standard stimulus for measuring vasomoter reactions: Its application to the study of hypertension. Proc. Staff Meeting Mayo Clinic, 1932, 7, 332.

Horan, J. J., Hackett, G., Buchanon, J., Stone, C. I., and Demchik-Stone, D. Coping with pain: A component analysis of stress-inoculation. Cognitive Therapy and Research, 1977, 1, 211-221.

Kazdin, A. E. and Wilcoxin, L. A. Systematic desensitization and nonspecific treatment effects: A methodological evaluation. Psychological Bulletin, 1976, 83, 729-758.

Lazarus, A. A. Relaxation exercise I. In Daily living: Coping with tensions and anxieties. Chicago: Instructional Dynamics, 1970 (audiotape cassette).

Meichenbaum, D. and Turk, D. The cognitive - behavioral management of anxiety, anger, and pain. In Davidson, P.O. (Ed.) The behavioral management of anxiety, depression and pain. New York: Brunner/Mazel, 1976.

Melzack, R. The puzzle of pain. New York: Basic Books, Inc., 1973.

Merskey, H., and Spear, F. G. The reliability of the pressure algometer. British Journal of Social and Clinical Psychology, 1964, 3, 130-136.